**Fig. 1
(prior art)**

**alternate
probe
beam**

**probe
beam**

**Fig. 2
(prior art)**

scattering
structure

substrate

**Fig. 3
(prior art)**

Fig. 4A
(prior art)

Fig. 4B
(prior art)

Fig. 4C
(prior art)

Fig. 5A

500

X_0' Z_0 X_0

Z

Y → X

502a

Z_1

line profile
504

502b

502c

Fig. 5B

500

X_0' Z_0 X_0

502a

line profile
504

Z_1

502b X_1' X_1

502c

Fig. 5C

500

X_0' Z_0 X_0

502a

line profile
504

X_1' 502b X_1

502c

Fig. 5D

500

Z_0 X_0

line profile
504

502a

X_2

Z_1 X_3

502b X_1

502c

Fig. 5E

500

Z_0 X_0

502a

X_2

line profile
504

Z_1 X_3

502b X_1

502c

Fig. 5F

500

Z_0 X_0

line profile
504

502a

Z_1 X_1

502b

502c

Fig. 5G

500

Z_0 X_0

502a

line profile
504

Z_1 X_1

502b

502c

Fig. 5H

500

Z_0 X_0

line profile
504

502a

Z_1

X_1

502b X_2

502c

Fig. 5I

500

Z_0 X_0

502a

line profile
504

Z_1

X_1

502b X_2

502c

Fig. 5J

500

Z_0 X_0

502a

X_2

X_3

502b X_1

502c

Fig. 5K

500

Z_0 X_0

502a

X_2

X_3

502b X_1

502c

Fig. 5L

500

Z_0 X_0

502a

X_2

X_3

502b X_1

502c

Fig. 5M

500

Z_0 X_0

502a

X_2

X_3

502b X_1

502c

Fig. 5N

500

Z_0 X_0

502a

Z_1 X_1

line profile
504

502b

502a

Fig. 5O

500

Z_0 X_0

502a

line profile
504

Z_1

502b X_1

502a

Fig. 5P

500

Z_0 X_0

502a

Z_1

line profile
504

502b X_1

502a

Fig. 5Q

500

Z_0 X_0

502a

X_2

line profile
504

Z_1 X_3

502b X_1

502a

Fig. 5R

500

Z_0 X_0

502a

X_2

line profile
504

Z_1

X_3

502b X_1

502a

Fig. 5S

500

Z_0 X_0

502a

Z_1

line profile
504

502b X_2

Z_2

502c X_1

502d

Fig. 5T

500

Z_0 X_0

Z_1

line profile
504

X_2

Z_2

X_1

Fig. 5U

500

X_0' Z_0 X_0

Z_1

502a

line profile
504

502b

502c

Fig. 5V

500

X_0' Z_0 X_0

Z_1

502a

line profile
504

502b

502c

Fig. 5W

500

X_0' Z_0 X_0

Z_2' Z_1 Z_2

502a

line profile
504

502b

502c

Fig. 5X

500

X_0' Z_0 X_0

Z_2' Z_1 Z_2

502a

line profile
504

502b

502c

Fig. 6

600

604

Calc Once
Calc & Fit
Stop Fitting

Export Ini file
Pick data file

Use material lib

Number of spacers: 0
Num of trench fills: 0

Number of Films: 5
Number of Layers in Lines: 1

Use Global Shape
Draw slices
Reset

CD Film Structure

| PR |
| SiARC |
| Poly |
| Thermal oxide |
| Crystalline Si |

606

Delete a Width
Add a Width

N Tries
Fitting:
Yes   0
Yes   0

PR
Name:
PR Thickness: Min: 0.000000   Max: 400.00000   Norm: 100.00000
# of Slices   1
Snap to top:
width   45.610001   0.000000   500.0000

608

Global Parameters

Technology: SE+DC

Max Iterations: 5

Wavelength range (nm):   From: 190   To: 780   Step: 5
Fitting: No

Pitch (nm):   Norm: 500.0000   Min: 100.0000   Max: 1000.0000

Show More Parameters

610

Height (nm)
350 300 250 200 150 100 50 0
Pitch(nm)
0 50 100 150 200 250 300

602

SE/BB coefficients
1 0.5 0 -0.5 -1.0
Wavelength(nm)
100 200 300 400 500 600 700 800

Fig. 7

<u>602</u>

<u>604</u>

Fig. 8

☐ Use Global Shape

☐ Draw slices

| Reset |

Number of Films: [5 ▲▼]

Number of Layers in Lines: [1 ▲▼]

Number of spacers: [0 ▲▼]

Num of trench fills: [0 ▲▼]

| Export Ini file | | Calc Once |

| Pick data file |

| Calc & Fit |

| Stop Fitting |

CD Film Structure

☐ Use material lib

PR

SiARC

Poly

Thermal oxide

Crystalline Si

Fig. 9

606

PR				Add a Width	Delete a Width

Name:	Norm:	Min:	Max:	Fitting:	N Tries
PR Thickness:	110.00000	0.000000	400.00000	Yes ▼	0
# of Slices	1	Snap to top:	☐		
width	45.610001	0.000000	500.00000	Yes ▼	0

Fig. 10

608

Global Parameters

	From:	To:	Step:	Max Iterations:	Technology:
Wavelength range (nm):	190	780	5	5	SE+DC ▼
	Norm:	Min:	Max:	Fitting:	
Pitch (nm):	500.00000	100.0000	1000.0000	No ▼	Show More Paremeters

Fig. 11

606

More fitting params:

	Norm:	Min:	Max:	Fitting:
Measurement angle:	0.0000	-10.0000	10.0000	No ▼
Mixing factor:	0.0033	0.0000	1.0000	Yes ▼
Sidewall:	0.0000	0.0000	1000.000	No ▼
Eccentricity:	0.0000	0.0000	1.0000	No ▼

More control params:

No Orders:	9	# of Thetas(BB):	2	
No Processors:	1	Interpolation:	Cubic-Spline ▼	
Model Option:	FTM-Conical ▼	Spline option:	2	
Fitting Option:	Levenberg-Marquar ▼	Slicing option:	Adaptive ▼	
# of Phis(SE):	1	Slice Scale:	2	
# of Thetas(SE):	2	Tolerance:	2	
# of Phis(BB):	1			

Fig. 12A
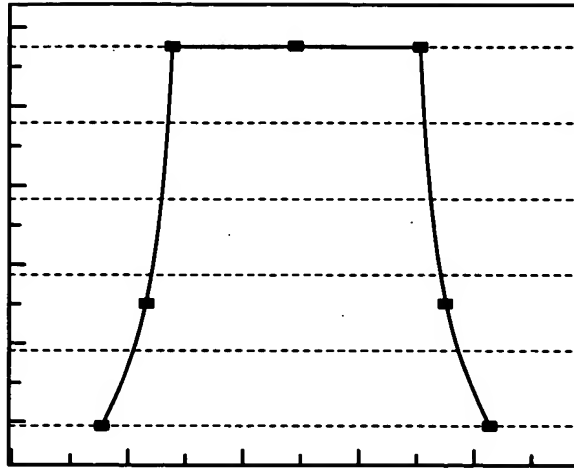
Fig. 12B
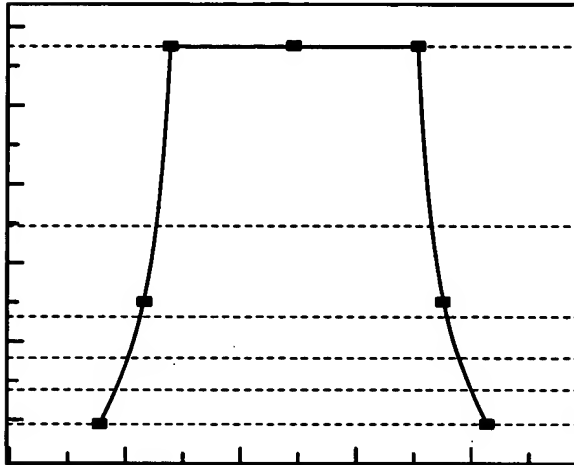
Fig. 12C
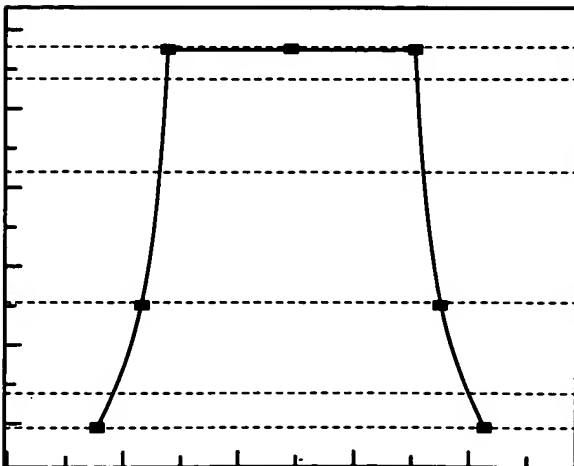
Fig. 13

610
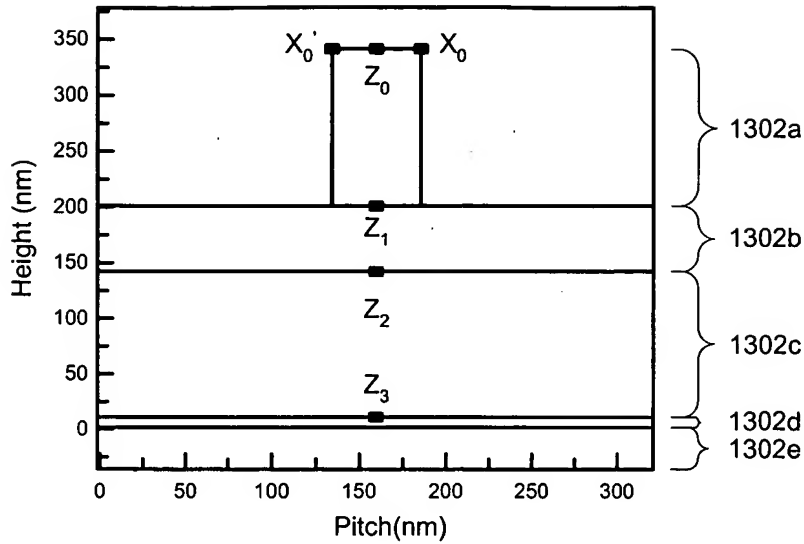
Fig. 14A

604

- ☐ Use Global Shape
- ☐ Draw slices

Reset

Number of Films: 5 ▲▼

Number of Layers in Lines: 1 ▲▼

Number of spacers: 0 ▲▼

Num of trench fills: 0 ▲▼

Export Ini file

Calc Once

Calc & Fit

Pick data file

Stop Fitting

┌─ CD Film Structure ──────────────────────────────────┐
│   ☐ Use material lib │
│   │
│   PR   │
│   PR   │
│   SiARC   │
│   Poly   │
│   Thermal oxide   │
│   Crystalline Si   │
│   │
└──┘

Fig. 14B

610
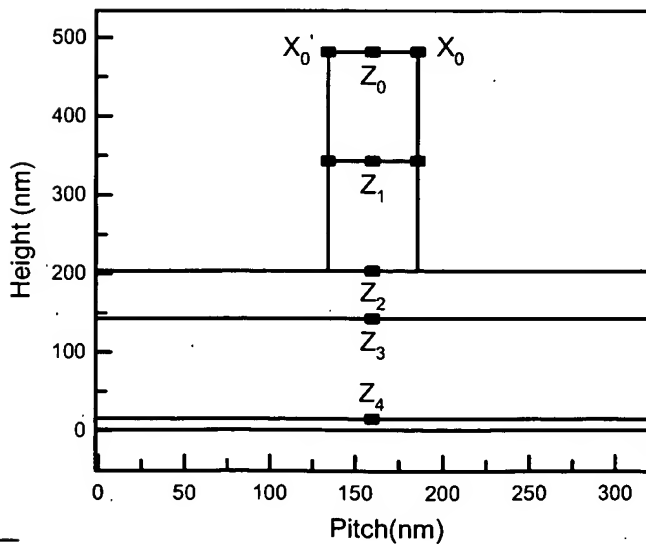
606

Fig. 15A

PR				Add a Width	Delete a Width
Name:	Norm:	Min:	Max:	Fitting:	N Tries
PR Thickness:	100.00000	0.000000	400.00000	Yes ▼	0
# of Slices	1	Snap to top:	☐		
width	45.610001	0.000000	500.00000	Yes ▼	0
width	40.810001	0.000000	500.00000	Yes ▼	0

610

Fig. 15B
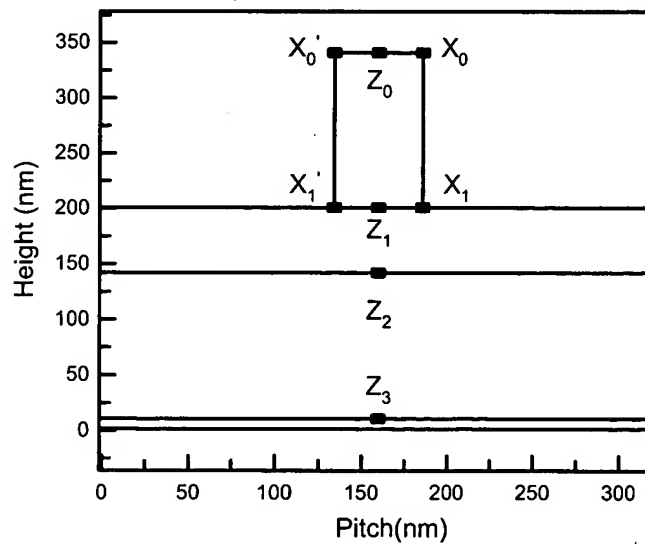
610

Fig. 15C
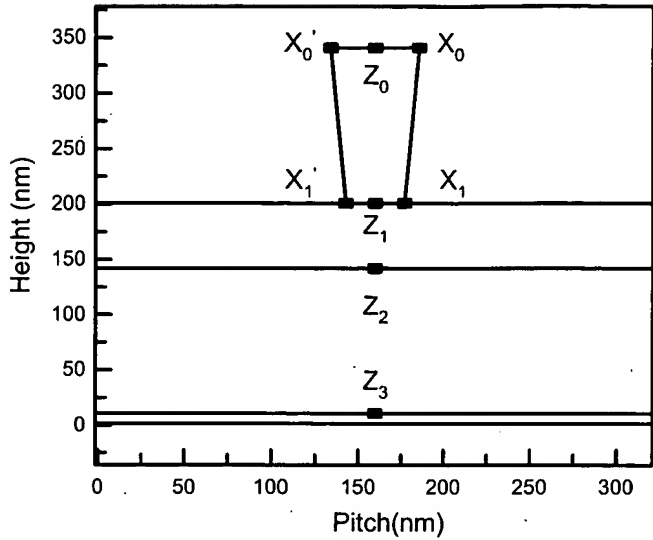
606

Fig. 15C

PR					Add a Width		Delete a Width
Name:	Norm:	Min:	Max:	Fitting:		N Tries	
PR Thickness:	100.00000	0.000000	400.00000	Yes ▼		0	
# of Slices	1	Snap to top:	☐				
width	45.610001	0.000000	500.00000	Yes ▼		0	
width	40.810002	0.000000	500.00000	Yes ▼		0	

Fig. 16A

604

☐ Use Global Shape	Number of Films:	5 ▲▼	Number of spacers:	0 ▲▼	Export Ini file	Calc Once
☐ Draw slices						Calc & Fit
Reset	Number of Layers in Lines:	2 ▲▼	Num of trench fills:	0 ▲▼	Pick data file	Stop Fitting

CD Film Structure ──────────────────────────────── ☐ Use material lib

| Darc_600t |
| Black Diamond |
| Black Diamond |
| Blok |
| Cu |

610

Fig. 16B
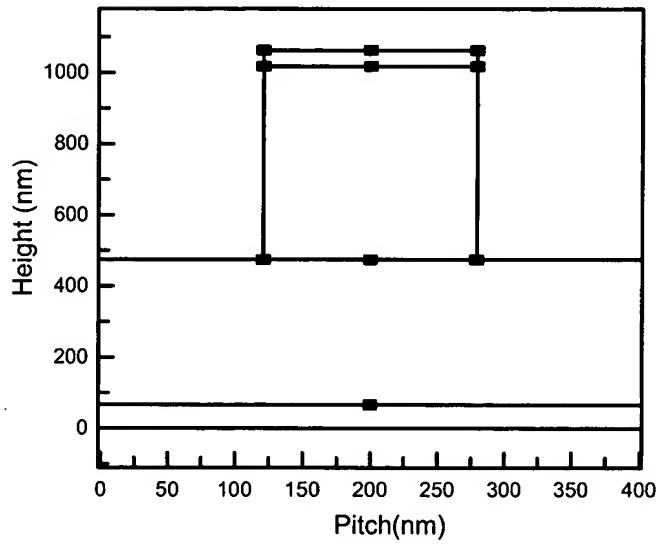
Fig. 16C
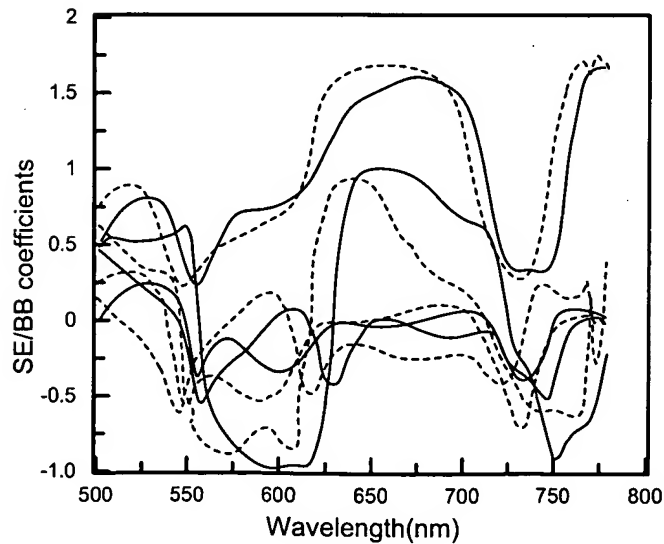
602

610

Fig. 16D
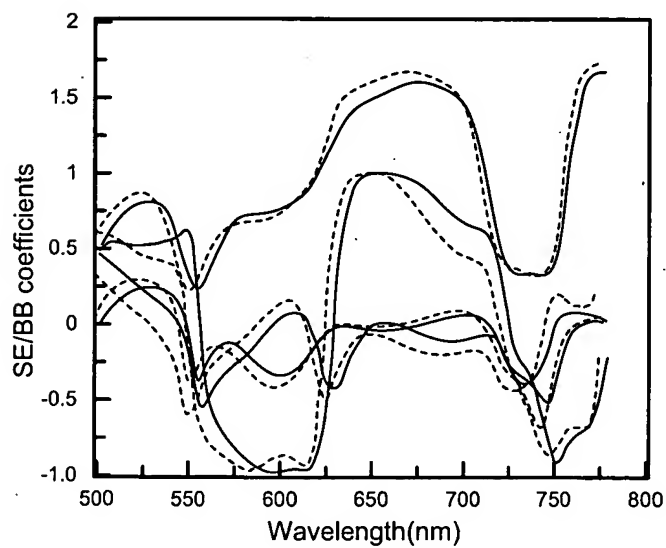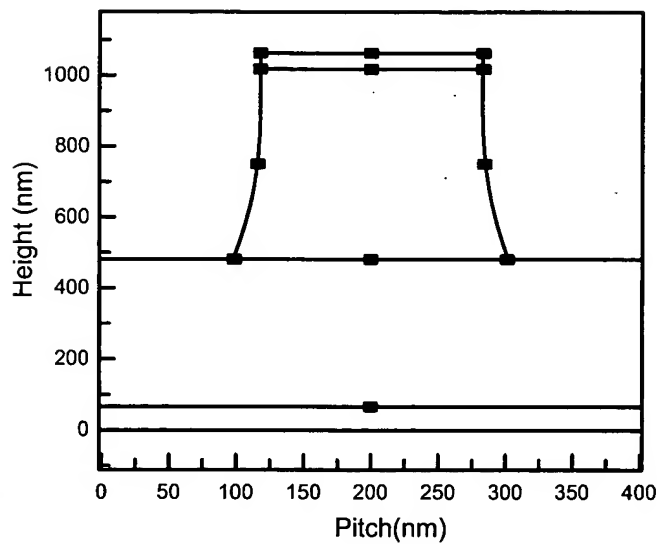
Fig. 16E

602

610

Fig. 16F

Fig. 16G

602

Fig. 17

1702
load
stored model

1704
evaluate model
and display
results

1706
edit
global
parameters

1708
edit
gross
definition

1710
edit
layer
properties

1712
interactive
shape changes

1714
evaluate model
and display
results

1716
save model